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ABSTRACT

Data are presented on four important aspects of the St. Louis education system's professional employee situation: (1) the pattern of movement from one part of the metropolitan area to another; (2) the survival behavior among the area's certified personnel; (3) the shift of personnel towards positions in administration as opposed to teaching; and (4) the side effects of these changes in salary payments in the system. The report concludes with a section on the effects of these four aspects on the school systems of large urban areas. (Author)

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Attrition, Mobility, and Productivity Among Teachers: The Case of Metropolitan St. Louis

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Attrition, Mobility, and Productivity Among Teachers: The Case of Metropolitan St. Louis

It is quite evident that public school systems in major metropolitan areas have been undergoing substantial changes during the past decade. These changes have occurred because of substantial population shifts, declining numbers of school age children, increasing financial strains, and changes in the career patterns of teachers. In this paper we present data showing how career patterns in the metropolitan St. Louis area have changed in seven years. We then show how these changes have become associated with important variations in certain characteristics of the area's school systems.

Data are presented on four important aspects of the education system's professional employee situation: 1) the pattern of movement from one part of the metropolitan area to another; 2) the survival behavior among the area's certified personnel; 3) the shift of personnel towards positions in administration as opposed to teaching; and 4) the side effects of these changes in salary payments in the system. We conclude with a section dealing with the effects of these four aspects on the school systems of large urban areas.

Data Sources

Through the cooperation of the Missouri State Board of Education, we have obtained data which describe all of the certified personnel in the public schools of the five counties of the Missouri portion of the St. Louis SMSA: St. Louis City, St. Louis, St. Charles, Jefferson and Franklin Counties. The data cover the period 1968 to 1974 and are in a form which allows us to use individuals, schools, school districts, or mixtures of all three as our unit of analysis. There are from

seventeen to twenty thousand people in any one year of the data file, and thirty three thousand in the file over the seven year period we examine.

Using the annual report for the schools of Missouri [10,11], as well as annual compilations of each district's statistics, we have been able to add district level variables having to do with tax base, number of students and total numbers of personnel to the file. More such variables are required. Notably absent are records dealing with where teachers were trained, when they received their training, the budgets of the districts, and the external causes of teachers' movement; for example, retirement, death, a move to another locale. We hope to add these data to our file at a later date.

Movement Patterns of Teachers

The Missouri portion of metropolitan St. Louis may be viewed as a large horseshoe, with the aging City of St. Louis in the middle of the open end and with much new residential and commercial development taking place all along the perimeter of the horseshoe. In the metropolitan area, this is accompanied by a process called neighborhood succession in which waves of people move from the urban core towards the fringes.

The effect of this expansion was described by Park, Burgess and McKenzie [12] in their work on the social ecology of Chicago. Burgess described it as

> ...a series of concentric circles which may be numbered to designate both the successive zones of urban extension and the types of areas differentiated in the process of expansion.
>
> This...represents an ideal construction of the tendencies of any town or city to expand radially from its central business district... Encircling the downtown area there is normally an area of transition which is being invaded by business and light manufacture. A third area is inhabited by the workers in industries who have escaped from the area of deterioration but who desire to live within easy access of their work. Beyond this zone is the residential area of high-class apartment buildings or of exclusive...single family dwellings...

> This...brings out clearly the main fact of expansion, namely the tendency of each inner zone to extend its area by the invasion of the next outer zone. This aspect of expansion may be called succession, a process which has been studied in detail in plant ecology. (Burgess, [2]).

The movement of people from the inner city to outer areas of the metropolis can be demonstrated by dividing the Missouri portion of the SMSA into six rings, as shown in Figure 1. The inner Ring (I) is formed by the City of St. Louis. Rings II and III are formed by older residential areas with some light industry. Generally speaking, these communities have had no physical room for expansion in the last eight years. Thus, they are relatively stable, except that succession has been more rapid in Ring II, where a black population increase is evident. Rings IV and V are bounded on their inner edges by well-developed extensions of the city. Their outer fringes are comparatively open and have been growing in recent years. Ring VI, which surrounds the built-up portion of the city, is predominantly rural, although it is occupied by some small towns.

Insert Figure 1

We hypothesized that the flow of population from the inner city to the suburbs would be accompanied by a like flow of teachers, and that these teachers would not be replaced in the inner rings. Therefore, rates of entry for new teachers would decline as areas stabilized and rise as they expanded.

Table 1 shows net flows of teachers across the various rings for the period 1968-1974. Over the seven year period, the City of St. Louis experienced a net loss of 284 teachers to the outer rings. Of these, 189 went into the adjacent rings (II and III). Rings II and III experienced a net loss of 179 teachers -- to Rings IV, V and VI. The pattern of movement is plain enough from this. Teachers are moving away from the center of the urban area and toward the suburbs (see Greenberg & McCall, [6]).

(Insert Table 1)

It seems that the people who are most likely to be able to move from one district to another are those who are relatively good. Personnel officers and recruiters who take even modest pains to screen staff would be able to eliminate the worst teachers and administrators from their pool of candidates, leaving "better" people as the basic pool from which movement would take place. This leaves the inner rings as the most likely losers of good, experienced talent.

Changes in Survival Patterns

There have been many studies of teacher turnover (see Charters [3]) and it is conventional wisdom that the profession is characterized by large numbers of people who teach for a few years and then quit, or else who teach only sporadically. Generally speaking, dropping out occurs more frequently among young, inexperienced teachers, and more frequently among females than males. At a district level, then, the most likely explanation for the rate of teacher drop-out lies in the proportion of teachers who are young, inexperienced and female. Thus, collective career patterns of individuals are important if we wish to see what the teaching experience of a district's staff will look like.

One way to examine these patterns is to study the survival rates of people who enter teaching. Figure 2 shows those rates for the groups who entered teaching in metropolitan St. Louis in the period 1968 to 1973. It is clear that the survival rate for each group is increasing.

(Insert Figure 2)

An examination of Table 2 shows that these increases are greater in the inner rings. The dropout rate for Ring I ranges from 14% to 8%, while for Ring IV it ranges from 19% to 11%. The same trend is apparent across the Table. The percentage

of dropouts is declining everywhere over time, but it is lower in the inner rings than in the outer rings for any given year. Indeed, the outer rings are now at about the same state as was Ring I in 1968.

(Insert Table 2)

Table 3 shows the percentage of each ring's staff that is new to teaching, along with the corresponding enrollment and staff size. The Table shows that the percentage of new entries to teaching is dropping regardless of changes in enrollment, this indirectly underscoring the importance of increased retention rates in restricting the flow of new entries to teaching.

(Insert Table 3)

Administrative Expansion

Many teachers who remain in the profession try to move up the career ladder. In public school systems such movement means promotion out of the classroom into some sort of administrative or support role -- librarian, counselor, principal, and so forth. A sizeable number of teachers prepare themselves for promotion within or across systems (see Griffiths, et al., [7]), and of these many are promoted.

Promotion is made possible by two factors: simple expansion of the system and expansion of the administrative component within the system. There is considerable debate over what seems to occur in schools, however. On the one hand, theorists argue that the administrative component can be smaller in relation to the size of the system in large systems. This view is supported by empirical evidence from schools in the work of Holdaway and Blowers [9]. On the other hand, there is also evidence that the administrative component of an organization grows independently of the rest of the organization (see Parkinson [13], ch. 1).

Table 4 shows the relationships between system size as measured by number of professional staff and enrollments and also shows the net change in the percentage of the staff in administrative positions. The table shows that the administrative component of the system does increase in size.[1] Particularly interesting is the decrease in the number of pupils per administrators and per teacher as a result of this growth. In part, this finding replicates the work of Gittel and Hollander [5] who found that the number of administrators per 1,000 pupils rose steadily over the ten year period of their study in two out of four districts studied. (They examined New York, Detroit, Chicago, St. Louis, Baltimore and Philadelphia.)

(Insert Table 4)

Parkinson makes the point more strongly in his study of the British admiralty and Foreign Service. For example, he cites a decline of 31.5% in the number of officers and men in the Royal Navy accompanied by a 78.5% increase in the number of men at the Admiralty Offices ([13], p. 21). Upon examining Table 4, we are inclined to agree with Parkinson, in that the growth of the administrative segment of school systems in these rings appears to be proceeding at a rate which cannot be accounted for by the growth of the systems being administered.

Since errors in predicting the size of the administrative component are largest in the fast-growing rings, we computed a regression equation to correct for changes in enrollment and also for changes in staff size, and then applied Parkinsons's law that the administrative component would grow at no less than 5.17% per year. That law, in conjunction with a correction for changes in enrollment and staff size, accounts for 45.2% of the variance in size of the administrative component over and above the effects of enrollment and staff size. It is statistically significant.

Generally speaking, the data seem to support the notion that increasing proportions of school resources are going into administrative rather than teaching functions. We view this development with some apprehension, since it is of substantial magnitude, its effects are unknown, and it seems to be happening without the conscious attention of school boards and other agencies responsible for setting school policy.

Costs

One result of the foregoing three factors is increased costs for education. While the overwhelming determinant of costs is enrollment, particularly enrollment which causes a need for capital expansion, the second more important factor is probably salary expense per pupil. It is in this area that schools in the older, slow growth or negative growth areas are in a difficult position. These systems have little need to add new personnel, the people who are on staff are older, have acquired more training, and are therefore more expensive. Moreover, the schools have no way to control this salary expense, for teachers gain experience and training at their discretion, not at the discretion of the school system which must then pay for them.

In the past, when large numbers of teachers had to be added to the system, it was partially possible to control salary expenses by controlling the mix of new teachers. Buying large numbers of young, inexperienced teachers would mean that large numbers of young, inexperienced people could be sought in the subsequent years to replace those who would drop out of teaching or move to another district. With both avenues of "escape" apparently cut off and with the rate of new entries to teaching dropping each year (see Table 5), control over salary costs is increasingly dependent upon negotiation with teachers' organizations.

(Insert Table 5)

The implications have not been pleasant for inner-city school systems. They were the first to bear the brunt of salary increases due to aging and more highly trained teachers. In time, the outer fringes will face the same problem, for if the notion of succession is correct, they are destined to experience declining enrollment and associated problems of increasing salary expense per student. Indeed, our data show the beginnings of this pattern for suburban districts.

The implications for teacher training institutions are unpleasant, also. In 1968, 1,921 teachers appeared as first-year teachers. By 1974, only 1,004 entered teaching for the first time. Schools of education may have to make very large adjustments to their organizations if declines of this magnitude persist.

To this point, we have established the following, at least to our satisfaction:

1. Teachers who move within the metropolitan area are moving toward the fringes. Moreover, the amount of movement which takes place has been decreasing over the past seven years.
2. Drop-out rates from teaching are highest in the outer, fast-growing areas of the metropolitan area, not in the central city where the teaching is "tough". Drop-out rates have been steadily decreasing in all areas over the past seven years.
3. The percentage of experienced teachers in each ring's force has increased by 7 to 14%. Almost every ring commences the school year with 90% of the staff carried over from the preceding year.
4. A corollary of declining enrollments growth and increased survival rates is that the percentage and number of new entries to the teaching force is declining each year. About 11-15% of the staffs of outer

rings were new entries in 1968. That figure is down to about 5-9%, and was about 4% in the inner ring. It is getting harder for new graduates to enter teaching, and the teaching force is getting older and more experienced with each year.

5. The number and percentages of people in administrative (non-teaching) positions has increased since 1968 regardless of declines or increases in enrollment.

Productivity

The foregoing points are important, in our view, only insofar as they affect the lives of the students who enter the school system. To investigate that, we enter upon a speculation about productivity in education.

There are two perspectives regarding productivity in schools. One perspective is that the "production" task is to inculcate knowledge and skills in students. The second view of productivity involves putting as many students through the system as possible (presumably with due regard to what the students know at the conclusion of their schooling).

With regard to the first view, research by Hanushek [8] found that recency of education and high intelligence of teachers had strong positive correlation with student achievement. Summers and Wolfe [14] found that teachers whose degrees were from the more highly ranked universities, who were young, or who were relatively inexperienced, all had students who had higher achievement test scores. They also found that scores on the National Teachers' Examination and the amount of education beyond the bachelor's degree were unrelated to student performance. Coleman, et al. [4], also found little relationship between advanced training and

experience of teachers and student achievement. Expansion of the administrative component of the staff is also related to student achievement, but negatively (Bidwell and Kasarda [1]), that is, the larger the administrative component, the poorer the student achievement.

All of this research suggests that for school systems to be most productive, they should concentrate effort on obtaining young, relatively inexperienced teachers with degrees from the more highly ranked universities. The evidence also suggests that school systems should not attempt to hire those teachers who are highly trained and have many years of experience, nor should decisions to hire be based on National Teachers' Examination test scores. Further, the evidence suggests that the administrative component of the staff should not be increased.

The foregoing points, juxtaposed against our findings of increasing size of administration, decreasing numbers of new teachers, and movement away from the poorer, inner-city district towards the suburban districts, lead us to believe that the ability of schools to "produce" knowledge is apt to decline, all other things being equal. Schools appear to be misallocating their resources if production of knowledge is the goal.

Even if schools are regarded as processing units whose productivity can be measured by counting the number of students taught, the outlook for future productivity is bleak if present trends continue. Our data show a steady increase in the administrative component of total staff, a steady decline in the pupil/teacher ratio, and a steady progression from inexperienced and inexpensive teachers towards experienced and expensive teachers. This, in turn, means that the cost of processing one student increases at a rate that is more than could be expected by salary increases alone. These things could be caused by

declining enrollment, but regardless of the causes, they mean increased costs for educational services whose quality appears no better in 1974 than in 1968.

The magnitude of change between 1968 and 1974 is startling. Table 6 shows the distribution of teachers by training and experience for the metropolitan area in 1968 and 1974. It also shows the distribution of the salary budget for the same years. It is clear from the table that the percentage of the salary budget being spent for the purchase of training and experience is growing very rapidly.

(Insert Table 6)

We computed a salary/staff ratio for the low training/low experience and high training/high experience cells of Table 6. In 1968, the low training/low experience cell contained 17.8% of the staff who received 12.9% of the total salary budget yielding a salary/staff ratio of .72. By 1974, the corresponding figures were 11.1% and 7.7%; a salary/staff ratio of .69 -- a slight decline.

On the other hand, the high experience/high training cell contained 21.6% of the staff in 1968. They received 22.7% of the salary or a ratio of 1.05. By 1974, the cell contained 23.9% of the people and they received 32.3% of the salary -- a salary/staff ratio of 1.35, which is a very large increase.

These figures show that while the percentage of people with expensive training and experience is increasing rapidly, their share of the total salary budget is increasing even more rapidly. This means that the salary budget will cover declining number of teachers. This, in turn, means higher per student costs unless the pupil/teacher ratio is increased. The productivity of teachers, then, will continue to decline very rapidly in the next few years.

The rate of decline will be highest in districts which presently contain predominantly inexperienced/untrained staffs. In our area, and we suspect others, this will be the suburban area ringing the central city.

Conclusion

Our findings to date indicate that schools are entering a period of sharply reduced productivity for teachers. The decrease is accentuated by declining enrollments and by movements of population within the urban area.

Unless some fairly drastic overhaul is made in the system's mode of operation, we feel that declines in the productivity are apt to continue for at least the next few years. This decline is coupled with a misallocation of resources by school managers who are purchasing teacher characteristics unrelated to student achievement, and with a growing inability of schools to guarantee economic success for their graduates. The foregoing factors indicate a bleak financial outlook for schools and teachers. The amount budgeted for teachers' salaries will have to increase as revenues decrease. The teaching profession, in turn, will be unable to maintain salaries at current levels in relation to those of other occupations where productivity is stable or increasing, where management must both organize to produce efficiently and select appropriate personnel, and where public confidence and esteem remain high.

Our findings are still sketchy, but we believe that our propositions about productivity in education can be verified by comparative studies conducted over time. We urge other researchers also to initiate such studies.

Footnotes

1. Administrators are superintendents, principals, supervisors, guidance counselors, and pupil personnel. Administrators, librarians, and teachers make up the total staff.

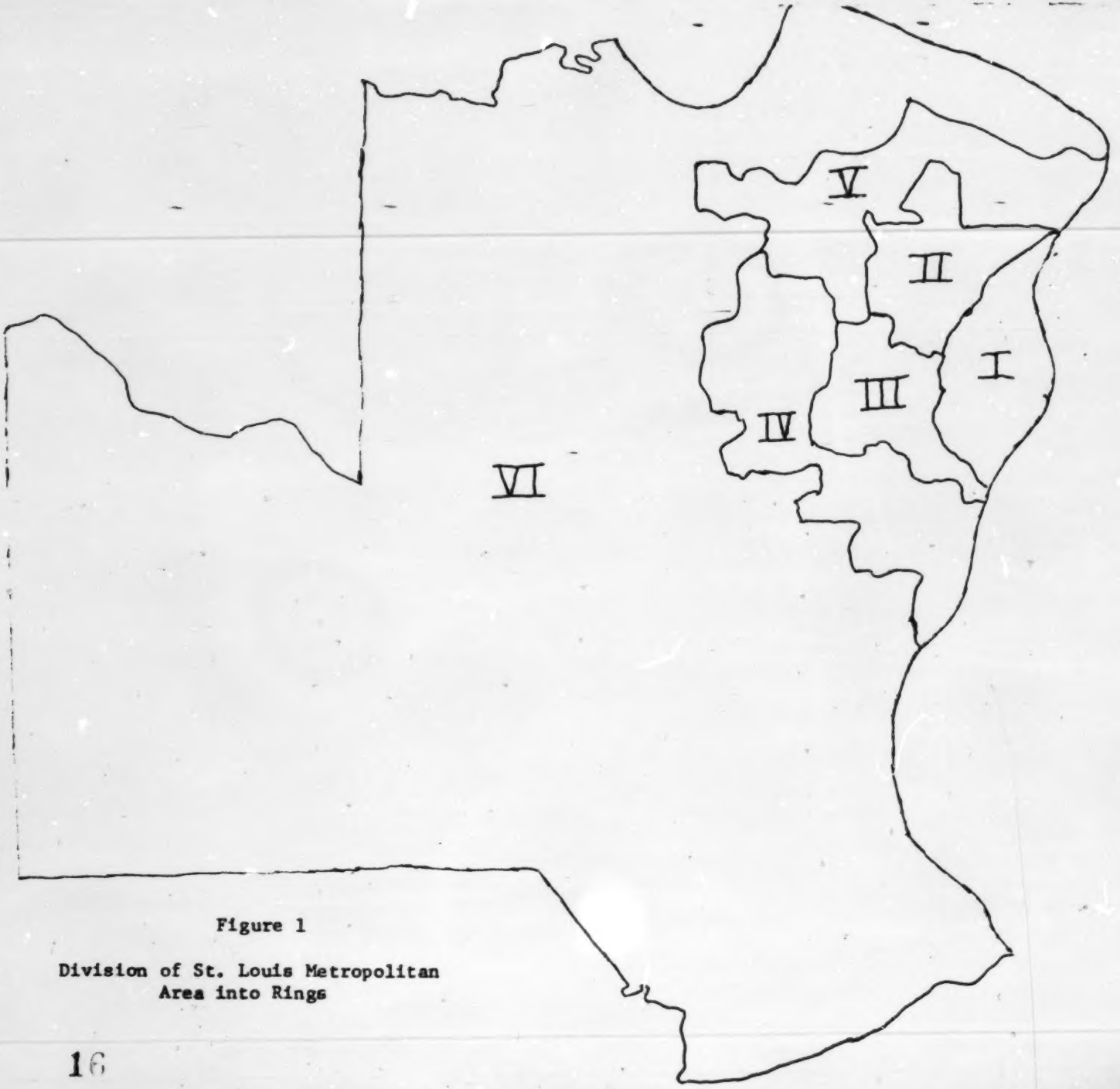

Figure 1

Division of St. Louis Metropolitan Area into Rings

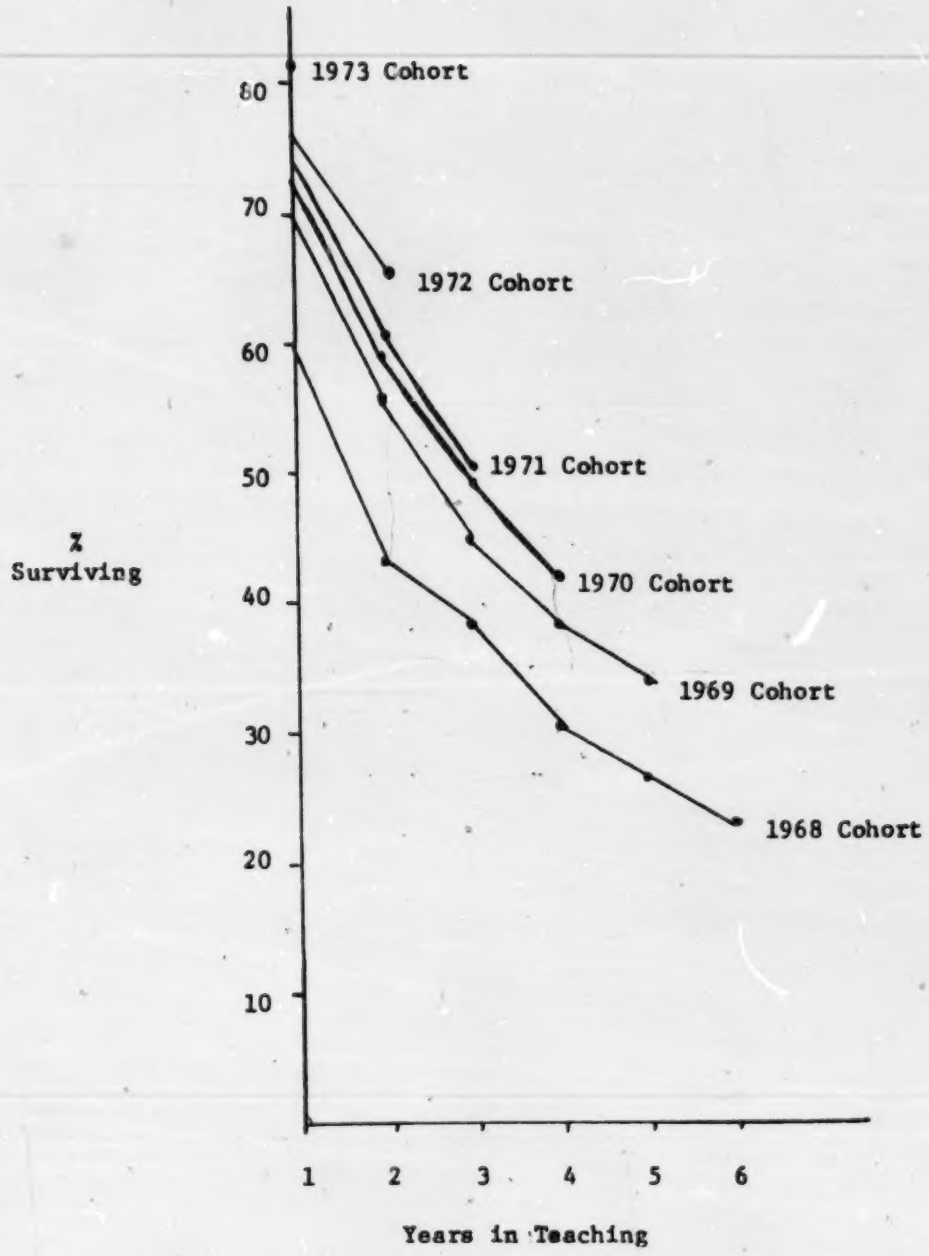

Figure 2

SURVIVAL RATES FOR COHORTS ENTERING TEACHING
IN 1968 THROUGH 1973

Table 1

NET MIGRATION FLOWS OF TEACHERS,
1968-1974

TO / FROM	Ring II	Ring III	Ring IV	Ring V	Ring VI
Ring I	147	42	46	16	33
Ring II		29	53	39	27
Ring III			40	16	2
Ring IV				-5	-8
Ring V					6

Table 2

DROP-OUT AND RETENTION RATES BY RING, 1968-1973

	Ring I			Ring II			Ring III			Ring IV			Ring V			Ring VI		
Year	Number	%Drop	%Stay	Number	%Drop	%Stay	Number	%Drop	%Stay	Number	%Drop	%Stay	Number	%Drop	%Stay	Number	%Drop	%Stay
1968	4792	14.4	84.0	3375	19.4	78.5	2372	16.5	81.4	1803	19.4	79.4	2451	19.8	77.3	1952	21.8	75.6
1969	4730	10.7	87.3	3537	19.5	78.9	2396	16.2	82.5	1986	18.8	79.8	2648	17.9	81.2	2088	19.3	79.7
1970	4778	8.1	90.6	3594	16.1	82.8	2391	12.1	86.9	2125	15.1	84.3	2833	16.2	83.3	2201	12.9	86.5
1971	4993	11.6	87.1	3697	13.0	85.8	2348	10.4	89.3	2244	12.1	87.6	3056	12.9	86.7	2325	11.9	87.6
1972	4960	9.2	89.9	3776	12.0	87.1	2345	12.0	86.9	2373	10.8	89.0	3338	12.1	87.5	2456	11.6	87.9
1973	4742	8.4	91.0	3754	12.3	86.3	2237	8.7	89.0	2483	11.0	88.7	3520	12.4	86.8	2480	9.4	89.9
1974	4659			3591			2175			2524			3698			2552		

Table 3

Enrollment, Number of Professional Staff, and Percentage of New Entrants by Ring and Year

	Ring I				Ring II				Ring III			
	Enrollment	Staff Size	New	%New	Enrollment	Staff Size	New	%New	Enrollment	Staff Size	New	%New
68	116,582	4,792	575	12.0	71,803	3,375	371	11.0	41,758	2,372	149	6.3
69	116,182	4,730	495	10.5	71,442	3,537	386	10.9	41,434	2,396	173	7.2
70	110,934	4,778	343	7.2	72,694	3,594	338	9.4	40,200	2,391	136	5.7
71	96,091	4,993	502	10.1	69,399	3,697	275	7.4	39,184	2,348	103	4.4
72	99,315	4,960	441	8.9	66,705	3,776	256	6.8	37,530	2,345	102	4.3
73	97,861	4,742	136	2.9	64,073	3,754	225	6.0	35,769	2,237	68	3.0
74	94,068	4,659	193	4.1	61,524	3,591	172	4.8	33,682	2,175	66	3.0

	Ring IV				Ring V				Ring VI			
68	38,603	1,803	254	14.1	56,401	2,451	272	11.1	40,527	1,952	300	15.4
69	42,456	1,986	246	12.4	60,147	2,648	388	14.7	43,170	2,088	263	12.6
70	44,294	2,125	244	11.5	63,304	2,833	323	11.4	45,113	2,201	199	9.0
71	45,700	2,244	191	8.5	67,113	3,056	324	10.6	45,597	2,325	149	6.4
72	47,029	2,373	185	7.8	69,558	3,338	351	10.5	46,226	2,456	213	8.7
73	47,850	2,483	169	6.8	70,874	3,520	301	8.6	45,559	2,480	205	8.3
74	47,735	2,524	115	4.6	71,698	3,698	316	8.5	44.676	2,552	142	5.6

Table 4

ENROLLMENT, # TEACHERS, # ADMINISTRATORS--BY RINGS AND YEARS

	Ring I			Ring II			Ring III			Ring IV			Ring V			Ring VI		
	Enrol	#Tch	#Adm	Enrol	#Tch	#Adm	Enrol	#Tch	#Adm	Enrol	#Tch	#Adm	Enrol	#Tch	#Adm	Enrol	#Tch	#Adm
1968	116582	4264	484	71803	2975	362	41758	2051	283	38603	1595	188	56401	2190	224	40527	1734	194
1969	116182	4224	461	71442	3077	401	41434	2056	298	42456	1742	207	60147	2384	229	43170	1843	216
1970	110934	4282	452	72694	3137	399	40200	2044	302	44294	1877	218	63304	2529	263	45113	1955	217
1971	96091	4455	491	69399	3167	469	39184	1999	301	45700	1951	245	67113	2698	309	45597	2033	256
1972	99315	4405	509	66705	3219	492	37530	1969	328	47029	2038	281	69558	2918	354	46226	2135	276
1973	97861	4026	673	64073	3184	500	35769	1871	318	47850	2140	288	70874	3068	379	45559	2147	284
1974	94068	3955	663	61524	3028	495	33682	1799	327	47735	2173	296	71698	3215	405	44676	2194	302
Net Change(%)	-19.3	-7.2	+37.0	-14.3	+1.8	+36.7	-19.3	-12.3	+15.5	+23.7	+36.2	+57.4	27.1	+46.8	+80.8	+10.2	+26.5	+55.7
Average Change(%)	-3.2	-1.2	+6.2	-2.4	+.3	+6.1	-3.2	-2.1	+2.6	+4.0	+6.0	+9.6	4.5	+7.8	+13.5	+1.7	+4.4	+9.3
'68 Pupils/ Admin.	240.9			198.4			147.6			205.3			251.8			208.9		
'74	141.9			124.3			103.0			161.3			177.0			147.9		
'68 Teachers/ Admin.	8.8			8.2			7.2			8.5			9.8			8.9		
'74	6.0			6.1			5.5			7.3			7.9			7.3		

Table 5

NEW ENTRIES TO TEACHING, SIZE OF THE STAFF AND STUDENT BODY: 1968-1974

Year	New Entrants	Staff Size	%New/Total	Student Population
1968	1,921	17,156	11.2%	369,255
1969	1,951	17,843	10.9%	378,682
1970	1,583	18,414	8.6%	380,705
1971	1,544	19,220	8.0%	366,631
1972	1,548	19,863	7.8%	371,229
1973	1,104	19,917	5.5%	367,687
1974	1,004	20,048	5.0%	360,459

Table 6

Distribution of Staff by Total Hours
and Total Experience

Experience (Years)	Total Hours		
	0-120	121-150	151+
1,2	19,021,824 (12.9) 3,043 (17.8) 17,095,465 (7.7) 2,157 (11.1)	1,803,725 (1.2) 281 (1.6) 3,022,927 (1.4) 385 (2.0)	1,088,398 (0.7) 154 (0.9) 1,978,284 (0.9) 215 (1.1)
3,4	10,989,809 (7.5) 1,621 (9.5) 14,893,711 (6.7) 1,722 (8.8)	3,798,607 (2.6) 547 (3.2) 7,430,746 (3.4) 838 (4.3)	1,644,255 (1.1) 216 (1.3) 3,644,623 (1.7) 374 (1.9)
5,6	6,682,367 (4.5) 913 (5.3) 11,267,449 (5.1) 1,196 (6.1)	3,700,782 (2.5) 491 (2.9) 7,811,055 (3.5) 814 (4.2)	3,060,569 (2.1) 361 (2.1) 6,116,006 (2.8) 571 (2.9)
7,8,9,10	7,851,371 (5.3) 986 (5.8) 11,238,898 (5.1) 1,099 (5.6)	5,688,344 (3.9) 683 (4.0) 11,104,340 (5.0) 1,034 (5.3)	7,813,123 (5.3) 824 (4.8) 14,919,976 (6.8) 1,219 (6.3)
11+	16,631,574 (11.3) 1,827 (10.7) 17,785,980 (8.1) 1,469 (7.5)	13,820,363 (9.4) 1,454 (8.5) 21,296,832 (9.6) 1,714 (8.8)	33,368,433 (22.7) 3,686 (21.6) 71,241,118 (32.3) 4,658 (23.9)

Key:

1968-69
$ salary (% total)
# staff (% total)
same
1974-75

Totals 1968-69
146,959,562
17,088
220,837,500
19,465
Totals 1974-75

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